

#7

SEQUENCE LISTING



<110> Triplett, Eric W  
Herlache, Thomas C.

<120> Biological Control of Crown Gall Disease

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<150> 60/224,929

<151> 2000-08-11

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<213> Rhizobium leguminosarum bv. trifolii

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Met Asp Asn Lys Val Ala Lys Asn Val Glu Val Lys Lys Gly Ser Ile  
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 Lys Ala Thr Phe Lys Ala Ala Val Leu Lys Ser Lys Thr Lys Val Asp  
 20 25 30  
 Ile Gly Gly Ser Arg Gln Gly Cys Val Ala  
 35 40

<210> 3

<211> 373

<212> PRT

<213> Rhizobium leguminosarum bv. trifolii

<400> 3

Met Asp Phe Val Gln Arg Phe Val Ile Asp Arg Ser Phe His Leu Arg  
 1 5 10 15

Tyr	Tyr	Ser	Leu	Asp	Ala	Tyr	Leu	Tyr	Arg	Ala	Val	Asp	Gln	Val	Ala	
			20					25					30			
Trp	Asp	Ala	Asp	Ile	Thr	His	Asn	Arg	Leu	Phe	Trp	Asp	Ile	Trp	Ser	
		35					40					45				
Ala	Phe	Met	Gln	Pro	Arg	Ser	Leu	Val	Asp	Ala	Val	Glu	Thr	Leu	Ser	
		50					55				60					
Asp	Tyr	Asp	Pro	Asp	Glu	Val	Ala	Ala	Ala	Ile	Glu	Gly	Met	Cys	Glu	
	65				70					75					80	
Ser	Gly	Ile	Ile	Glu	Pro	Val	Gly	Leu	Lys	Asp	Arg	Gln	Phe	Asp	Pro	
			85					90						95		
Leu	Thr	Val	Glu	Leu	Ser	His	Val	Pro	Gln	Ala	Trp	Asp	Tyr	His	Leu	
			100					105					110			
Val	Ser	Ser	Arg	Ile	Asp	Trp	Ile	Asn	Tyr	Leu	Asp	Gly	Lys	Asp	Val	
		115					120					125				
Lys	Arg	Gln	Asp	Leu	Glu	Gln	Met	Asp	Lys	His	Leu	Ser	Glu	Glu	Ala	
	130					135					140					
Val	Pro	Ser	Asn	Phe	His	Lys	Ala	Ala	Asn	Ser	Arg	Pro	Lys	Tyr	Asp	
	145			150						155					160	
Leu	Pro	Ser	Leu	Val	Pro	Leu	Thr	Ala	Phe	Glu	Phe	Asn	Asn	Ser	Ala	
			165					170						175		
Ser	Val	Ala	Phe	Gly	His	Glu	Lys	Ala	Pro	Leu	Pro	Asn	Glu	Leu	Ser	
			180					185					190			
Leu	Asp	Ile	Ile	Thr	Leu	Leu	Leu	Asn	Tyr	Ala	Ala	Ala	Lys	Thr	Asp	
	195						200					205				
Thr	Val	Asn	Met	Tyr	Ala	Thr	Gly	Glu	His	Leu	Arg	Lys	Ala	Val	Pro	
	210					215					220					
Ser	Gly	Gly	Ala	Arg	His	Pro	Ile	Glu	Phe	Tyr	Val	Val	Val	Gly	Asp	
	225				230				235						240	
Glu	Ile	Ala	Gly	Ile	Glu	Ala	Gly	Val	Tyr	His	Tyr	Asn	Val	Arg	His	
			245					250						255		
His	Arg	Leu	Asp	Ala	Ile	Glu	Ile	Ala	Ser	Thr	Ser	Leu	Lys	Ala	Leu	
		260						265					270			
Gln	Glu	Ala	Ser	Ser	Val	Leu	Pro	Arg	Ser	Arg	Ser	Lys	Pro	Phe	Gly	
	275						280					285				
Phe	Ala	Phe	Ile	His	Thr	Cys	Arg	Phe	Glu	Arg	Ser	Met	Phe	Arg	Tyr	
	290					295					300					
Arg	Glu	Pro	Arg	Ser	Tyr	Arg	Val	Met	Gln	Phe	Asp	Leu	Gly	His	Ile	
	305				310					315					320	
His	Ala	Asn	Glu	Val	Leu	Ala	Ala	Lys	Ile	Leu	Gly	Leu	Asp	Phe	Ser	
			325					330						335		
Glu	Thr	Phe	Ser	Val	Pro	Glu	Ser	Ile	Val	Glu	Ser	Val	Leu	Thr	Leu	
		340					345						350			
Asp	Pro	Phe	Ile	Glu	Ser	Ala	Met	Ser	Ala	Phe	Val	Val	His	Arg	His	
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Glu	Asn	His	His	Asp												
	370															

<210> 4  
 <211> 416  
 <212> PRT  
 <213> Rhizobium leguminosarum bv. trifolii

<400> 4

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Ala Ser Ile Ser Trp Arg Arg Met Ile Pro Asn Val Ala Asp Thr Ile
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Val Val Thr Leu Ile Gly Ala Thr Ala Leu Gln Val Ala Ser Asn Val
 35           40           45
Leu Ile Thr Ile Leu Thr Leu Asn Ile Ala Phe Leu Asn Phe Cys Ser
 50           55           60
Leu Ile Cys Met His Asn Leu Lys Arg Gly Ala Lys Ala Asp Val Phe
 65           70           75           80
Ala Ala Ile Val Arg Ala Ala Cys Met Met Ile Gly Val Tyr Leu Ala
 85           90           95
Leu Ile Ala Val Ser Val Ala Thr Leu Glu Gly Ala Pro Arg Thr Gln
 100          105          110
Thr Ile Ala Phe Ile Ala Leu Ser Ala Leu Arg Pro Phe Val Ala Gly
 115          120          125
Trp Asn Ala Tyr Cys Ala Glu Val Phe Phe Ala Gln Gly Lys Arg Gln
 130          135          140
Ile Val Arg Ser Val Ile Thr Arg Ser Ser Leu Ile Tyr Ala Gly Val
 145          150          155          160
Asn Leu Leu Phe Val Gly Leu Ser His Phe Ala Gly Thr Gln Asn Ser
 165          170          175
Ile Ile Ser Leu Leu Ile Gly Val Tyr Leu Ala Leu Phe His Asn Ala
 180          185          190
Leu Ala Tyr Ala Arg Ile Leu Pro Thr Glu Trp Arg Phe Ser Arg Gln
 195          200          205
Asp Leu Lys Asp Val Phe Ser Leu Arg Lys Leu Asp Leu Val Gly Ile
 210          215          220
Gly Ala Gly Leu Ser Ala Ser Phe Ile Asn Met Leu Glu Met Gly Phe
 225          230          235          240
Leu Ala Leu Val Gly Trp Val Val Ala Ala Lys Phe Pro Gln Ile Ala
 245          250          255
Val Phe Tyr Phe Pro Phe Phe Thr Leu Val Glu Leu Thr Ser Gly Leu
 260          265          270
Ala Ile Gly Leu Gly Arg Ser Val Thr Glu Arg Leu Ile Thr Pro Arg
 275          280          285
Pro Phe Pro Arg Leu His Val Leu Ile Ala Val Tyr Ser Thr Tyr Ser
 290          295          300
Leu Leu Cys Phe Leu Ile Tyr Val Gly Leu Ile Gly Val Ser Asn Arg
 305          310          315          320
Asp Ile Phe Ala Leu Pro Leu Ser Leu Ala Gly Leu Ala Leu Leu Phe
 325          330          335

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Leu Ile Cys Asp Gly Leu Gln Leu Val Val Arg Gly Tyr Thr Leu Ala  
 340 345 350  
 Lys Ala Asp Gly Gly Lys Leu Thr His Leu Ser Ala Ile Ala Tyr Leu  
 355 360 365  
 Ala Ser Gly Val Ile Leu Ala Leu Ala Ala Val Leu Gly Ser Val Gln  
 370 375 380  
 Ala Leu Ala Ile Ala Leu Val Leu Gly Pro Leu Phe Leu Ala Ile Ser  
 385 390 395 400  
 Ile Pro Ala Val Gln Ser Arg Thr Ala Leu Asn Ala Leu Pro Asn Arg  
 405 410 415

<210> 5  
 <211> 258  
 <212> PRT  
 <213> Rhizobium leguminosarum bv. trifolii

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 Glu His Leu Glu Val Pro Glu Ala Tyr Phe Gln Ala Tyr Asp Pro Leu  
 35 40 45  
 Thr Thr Trp Phe Glu Trp Phe Ser Arg Ile Gly Tyr Arg Asp Tyr Thr  
 50 55 60  
 Asp Ala Glu Ala Glu Ile Glu Arg Asp Ala Glu Glu Asn Val Arg Gln  
 65 70 75 80  
 His Gln Val Ser Val Gln Pro Asp Leu Thr Leu Thr Gln Arg Leu Ser  
 85 90 95  
 Ser Glu Gly Ser Ile Gln Leu Pro Val Pro Phe Leu Lys Thr Ala Asp  
 100 105 110  
 Gln Phe Cys Ile Leu Ser Ser Leu Leu Tyr Ala Gly Phe Gly Val Val  
 115 120 125  
 Glu Thr Arg Lys Phe His Gly Asp Thr Ile Phe Leu Lys Asn Val Pro  
 130 135 140  
 Ser Val Gly Ala Arg His Gly Ile Glu Ala Tyr Val Ser Leu Asp Asp  
 145 150 155 160  
 Gly Arg Tyr Tyr Tyr Asp Cys Glu Gln His Arg Leu Phe Ser Ala Gly  
 165 170 175  
 Tyr Arg Gly Asp Leu Arg Ser Gly Gln Ile Asp Ile Val Phe Arg Pro  
 180 185 190  
 Glu Val Tyr Met Trp Arg Tyr Gln Thr Ala Ala Cys Leu Ala Asp Val  
 195 200 205  
 Tyr Leu Asp Leu Gly His Ile Leu Gly Thr Leu Ser Met Val Ala Ser  
 210 215 220  
 Leu Tyr Asp Thr Ser Ile Thr Ser Arg Ser Ala Glu Ala Ala Pro Val  
 225 230 235 240

Asp Leu Ile Asn Ala Val His Leu Gln Arg Ile Ala Val Asp Gly Phe  
245 250 255

Asn Pro

<210> 6

<211> 261

<212> PRT

<213> Rhizobium leguminosarum bv. trifolii

<400> 6

Met	Asn	Asp	Glu	Ile	Cys	Leu	Thr	Gly	Gly	Gly	Arg	Thr	Thr	Val	Thr
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			20						25					30	
Val	Ile	Ser	Leu	Leu	Arg	His	Leu	Glu	Ala	Ser	Gly	Phe	Ala	Glu	Ala
			35						40				45		
Pro	Ser	Val	Val	Gly	Thr	Gly	Phe	Asp	Glu	Arg	Gly	Arg	Glu	Thr	Leu
			50				55					60			
Ser	Phe	Ile	Glu	Gly	Glu	Phe	Val	His	Pro	Gly	Pro	Trp	Ser	Glu	Glu
65						70					75				80
Ala	Phe	Pro	Gln	Phe	Gly	Met	Met	Leu	Arg	Arg	Leu	His	Asp	Ala	Thr
				85						90				95	
Ala	Ser	Phe	Lys	Pro	Pro	Glu	Asn	Ser	Met	Trp	Arg	Asp	Trp	Phe	Gly
			100						105				110		
Arg	Asn	Leu	Gly	Glu	Gly	Gln	His	Val	Ile	Gly	His	Cys	Asp	Thr	Gly
		115					120					125			
Pro	Trp	Asn	Ile	Val	Cys	Arg	Ser	Gly	Leu	Pro	Val	Gly	Leu	Ile	Asp
		130					135					140			
Trp	Glu	Val	Ala	Gly	Pro	Val	Arg	Ala	Asp	Ile	Glu	Leu	Ala	Gln	Ala
145						150				155					160
Cys	Trp	Leu	Asn	Ala	Gln	Leu	Tyr	Asp	Asp	Asp	Ile	Ala	Glu	Arg	Val
				165						170				175	
Gly	Leu	Gly	Ser	Val	Thr	Met	Arg	Ala	His	Gln	Val	Arg	Leu	Leu	Leu
			180						185				190		
Asp	Gly	Tyr	Gly	Leu	Ser	Arg	Lys	Gln	Arg	Gly	Gly	Phe	Val	Asp	Lys
		195					200					205			
Leu	Ile	Thr	Phe	Ala	Val	His	Asp	Ala	Ala	Glu	Gln	Ala	Lys	Glu	Ala
		210					215					220			
Ala	Val	Thr	Pro	Glu	Ser	Asn	Asp	Ala	Glu	Pro	Leu	Trp	Ala	Ile	Ala
225						230					235				240
Trp	Arg	Thr	Arg	Ser	Ala	Ser	Trp	Met	Leu	His	His	Arg	Gln	Thr	Leu
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Glu	Ala	Ala	Leu	Ala											
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<210> 7  
<211> 7142  
<212> DNA  
<213> *Rhizobium leguminosarum* bv. *trifolii*

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<223> tfxE coding sequence

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tggatcgata tacaaaagtg taatctcgcc actaacaaga gccgatccga ctctctttac 180  
tagtccggca accttagctg taagaaatat tgagtgcggg ttgtcaatcc acatcgatac 240  
gtttgctgcg gtcttggttct ccaaccactc atctatctcg gcagaatttc cgtgatgggc 300  
agccaagcaa agttctgcga ttgatcgccg caatacacgg gcgcagtcgg cggcatctat 360  
cgccgaagcg tcaccaatth cgcgagcgag gttttctcgc tgcataatth ttttctttcc 420  
tgaatcgatc attagttgtg ttttttggtg ctctcgacgt atttgcaacc gtttgattcg 480  
attgcgatatt tgtcaaaata ctccatatga ttgcattttt taaaagacaa gatagggtca 540  
catttgctcag caaatgactg ctggcaaacc ccaatcgcta aatgaggtgt tgttgcatgg 600  
ataacaaggt tgcgaagaat gtcgaagtga agaagggtc catcaaggcg accttcaagg 660  
ctgctgttct gaagtcgaag acgaaggctg acatcggagg tagccgtcag ggctgcgtcg 720  
cttaagtga catccggcgg gtgcggcaaa cgtacccgcc acttatgcc tcgctttcaa 780  
cgggatgttt cgcattgact tcgtccaacg attcgtaatc gaccgctctt tccacctccg 840  
ctactacagc ctcgacgcct atctatatcg cgcagttgac caggctgcct gggacgcaga 900  
catcactcac aatcgctat tttgggacat ttggtcagca ttcattgcag cgagaagtct 960



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cgagtccgcg atgtcagcct ttgtcgtcca cagacacgag aaccacc atg att gaa 1916
                                     Met Ile Glu
                                     1

ctg cgc ccg ctt ctc caa ctg aat ctt gaa gat gga atc ccg gtc ctc 1964
Leu Arg Pro Leu Leu Gln Leu Asn Leu Glu Asp Gly Ile Pro Val Leu
      5              10              15

aaa gac ctc ctg acc gcc gac agc ttt tcc ttc acc gat gtt gaa ctc 2012
Lys Asp Leu Leu Thr Ala Asp Ser Phe Ser Phe Thr Asp Val Glu Leu
    20              25              30              35

ttg cgg tac att cca gcc att gcc aag aac acc ccc gcc cag act cgg 2060
Leu Arg Tyr Ile Pro Ala Ile Ala Lys Asn Thr Pro Ala Gln Thr Arg
              40              45              50

gat ttg gct gcc tct gtt gct gat gcg ctg gat gtt gac caa acc acc 2108
Asp Leu Ala Ala Ser Val Ala Asp Ala Leu Asp Val Asp Gln Thr Thr

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70	75	80	
tcc gcg tcg atc tcc tcg cag aag gca ggg atc cag ttg tgg gtg gat			2204
Ser Ala Ser Ile Ser Ser Gln Lys Ala Gly Ile Gln Leu Trp Val Asp			
85	90	95	
aag gga tgg gtg gac gca ctg atc ctg cat ttc gcg agc aga aat ctc			2252
Lys Gly Trp Val Asp Ala Leu Ile Leu His Phe Ala Ser Arg Asn Leu			
100	105	110	115
aat tat aat gac gat cca att gaa ttt ggc ggg ttg gag gat atc aaa			2300
Asn Tyr Asn Asp Asp Pro Ile Glu Phe Gly Gly Leu Glu Asp Ile Lys			
120	125	130	
agc tat ccc gaa ccg atg gaa tcg aag cgt agg aaa cgc ggc acc gcc			2348
Ser Tyr Pro Glu Pro Met Glu Ser Lys Arg Arg Lys Arg Gly Thr Ala			
135	140	145	
acg cga ttg gtc aag ccg tcc ccg gag ctg gca gct gca gtc ata ctg			2396
Thr Arg Leu Val Lys Pro Ser Arg Glu Leu Ala Ala Val Ile Leu			
150	155	160	
gac ggg ctc atg aac agg cgc tcg ttc aaa ccc ttc aca cgc aaa caa			2444
Asp Gly Leu Met Asn Arg Arg Ser Phe Lys Pro Phe Thr Arg Lys Gln			
165	170	175	
ctg tcg atc acc gag gtc agc gag ata ctt tgg ttt ggg aac ctc tat			2492
Leu Ser Ile Thr Glu Val Ser Glu Ile Leu Trp Phe Gly Asn Leu Tyr			
180	185	190	195
gcg cga gaa cgc gcg gtc atc gct gaa aat cgt gac ttc gag tct cct			2540
Ala Arg Glu Arg Ala Val Ile Ala Glu Asn Arg Asp Phe Glu Ser Pro			
200	205	210	
cgc gat ata gct ttc gac agc gcc ttc tca gcg ttg tcc acc ttt gtt			2588
Arg Asp Ile Ala Phe Asp Ser Ala Phe Ser Ala Leu Ser Thr Phe Val			
215	220	225	
gtc aca tat gga cag atc gat tgg cag gat ggc tcg ttg cca ccc gga			2636
Val Thr Tyr Gly Gln Ile Asp Trp Gln Asp Gly Ser Leu Pro Pro Gly			
230	235	240	
gtc tat cgt tac aat gtc gtc aat cac gaa ctt gaa gca atc aga gcc			2684
Val Tyr Arg Tyr Asn Val Val Asn His Glu Leu Glu Ala Ile Arg Ala			

245	250	255	
ggt gat ttc aag ctg gac atg gca aaa ctc gct atc ggt cag agt cgg			2732
Gly Asp Phe Lys Leu Asp Met Ala Lys Leu Ala Ile Gly Gln Ser Arg			
260	265	270	275
gct tcg agc ggg cta ttc acg ttt gtg atc tgc ggc gat ttg aag tca			2780
Ala Ser Ser Gly Leu Phe Thr Phe Val Ile Cys Gly Asp Leu Lys Ser			
	280	285	290
tac aca tcg cgg tac agg cac gag cgg agc tac cgc aat ctg ctg atc			2828
Tyr Thr Ser Arg Tyr Arg His Glu Arg Ser Tyr Arg Asn Leu Leu Ile			
	295	300	305
aac acc tca cag ctc gcc caa ttc tat ttg acc ctc gca acg atc aac			2876
Asn Thr Ser Gln Leu Ala Gln Phe Tyr Leu Thr Leu Ala Thr Ile Asn			
	310	315	320
gac ttc aac acc ttt ctc acg ccc gcc atc cac gat gag aaa atg cat			2924
Asp Phe Asn Thr Phe Leu Thr Pro Ala Ile His Asp Glu Lys Met His			
	325	330	335
ctg ttt ctt gaa gcg gag gac gac ctc ccg ctt tat ctc gtc acg gca			2972
Leu Phe Leu Glu Ala Glu Asp Asp Leu Pro Leu Tyr Leu Val Thr Ala			
	340	345	350
ggc tagagcatga ggcagcaaaa ccagcatggg ttctatcgga cttcggttcga			3025
Gly			
atacgcatcg atcagttggc ggagaatgat tcccaatgtg gctgacacta tcgtcgtcac			3085
gctcatcggc gctactgcac ttcaggtggc gtcaaagtgt ctgatcacga tactgaccct			3145
caatatcgct tttctgaact tttgctcgt tatctgcatg cacaatctga aaagaggggc			3205
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acttcggaag	cttgatctgg	tcggaatcgg	ggcagggcctt	tctgcgtctt	ttatcaacat	3685
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gttccttgca	atctccattc	ccgccgttca	aagtcgaact	gccctaa	atg cac tac	4221
					Met His Tyr	
cga aca gat aaa ccg aaa gta ttc gta acc gac tcc ggc agg ttt gtt	4269					
Arg Thr Asp Lys Pro Lys Val Phe Val Thr Asp Ser Gly Arg Phe Val						
360 365 370 375						
gct gac tgc cag ata att ctg ctt ggt cgc aag atc ata tgt acg gga	4317					
Ala Asp Cys Gln Ile Ile Leu Leu Gly Arg Lys Ile Ile Cys Thr Gly						
380 385 390						
acc gat ctt cag tac gag att gcg gtt gca aaa gca aag tct gag ctt	4365					
Thr Asp Leu Gln Tyr Glu Ile Ala Val Ala Lys Ala Lys Ser Glu Leu						
395 400 405						
gcg gag agg atc gcg ttt gca tca cca gac gcc ttc aat gcg cga gtg	4413					
Ala Glu Arg Ile Ala Phe Ala Ser Pro Asp Ala Phe Asn Ala Arg Val						
410 415 420						
acg cggtt gca agg cgt ctc atg ctc gaa gct acc aat gcc ttc aac	4461					
Thr Arg Val Ala Arg Arg Leu Met Leu Glu Ala Thr Asn Ala Phe Asn						
425 430 435						
aga gaa tcc gtc acc ctg ccg ttg agc ttg ttc gta acg cgg cca cat	4509					
Arg Glu Ser Val Thr Leu Pro Leu Ser Leu Phe Val Thr Arg Pro His						
440 445 450 455						
ctg tgc tgg atg cgc ggc aac aac tcc aca gga ttt gcc gca cat ccc	4557					
Leu Cys Trp Met Arg Gly Asn Asn Ser Thr Gly Phe Ala Ala His Pro						

460	465	470	
cgg cgc aag gca gca att gaa cac gcg gtc aat gag gtt tta gag cgc			4605
Arg Arg Lys Ala Ala Ile Glu His Ala Val Asn Glu Val Leu Glu Arg			
475	480	485	
ggc tgg aac gct cgg ttt cga cga gat cag cag tct ctt ctt aag ttg			4653
Gly Trp Asn Ala Arg Phe Arg Arg Asp Gln Gln Ser Leu Leu Lys Leu			
490	495	500	
gcc acg atc cga cga gac ggt tca aca gct tgg gta cac gaa tcg agg			4701
Ala Thr Ile Arg Arg Asp Gly Ser Thr Ala Trp Val His Glu Ser Arg			
505	510	515	
ctc cgc cag gtt tcc tac tgc ttg gcc aac gcc cgt gtt gcg gga cat			4749
Leu Arg Gln Val Ser Tyr Cys Leu Ala Asn Ala Arg Val Ala Gly His			
520	525	530	535
gtc ggt tgg ggt tcc gca gtt cgc aga acg acc gaa gcg gca gtg gaa			4797
Val Gly Trp Gly Ser Ala Val Arg Arg Thr Thr Glu Ala Ala Val Glu			
540	545	550	
gct gca act agt gaa gcc cat gcg atg agt gcg tcg ggg cag gat tac			4845
Ala Ala Thr Ser Glu Ala His Ala Met Ser Ala Ser Gly Gln Asp Tyr			
555	560	565	
ggc cgc ggc gga acc ggc gtg tcg gag ctt ccc tcg caa cac gac caa			4893
Gly Arg Gly Gly Thr Gly Val Ser Glu Leu Pro Ser Gln His Asp Gln			
570	575	580	
atc gcg ttt gtc gag agg cag ccg gtg cgc atc gat gac gtc act cat			4941
Ile Ala Phe Val Glu Arg Gln Pro Val Arg Ile Asp Asp Val Thr His			
585	590	595	
tac gtg ata cag gcg gtg agt tat tca tgagagcaag caaacaccg			4988
Tyr Val Ile Gln Ala Val Ser Tyr Ser			
600	605		
atcttgataa acggctctcc gtggttgta gatttccgtc ggcggtcaag ccgagaattc 5048			
gattgggaaa ttgccgaaca tctagaggtg cccgaagcat attttcaggc gtatgaccgc 5108			
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<210> 8

<211> 356

<212> PRT

<213> *Rhizobium leguminosarum* bv. *trifolii*

<400> 8

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Pro	Val	Leu	Lys	Asp	Leu	Leu	Thr	Ala	Asp	Ser	Phe	Ser	Phe	Thr	Asp
			20					25						30	
Val	Glu	Leu	Leu	Arg	Tyr	Ile	Pro	Ala	Ile	Ala	Lys	Asn	Thr	Pro	Ala
		35				40						45			
Gln	Thr	Arg	Asp	Leu	Ala	Ala	Ser	Val	Ala	Asp	Ala	Leu	Asp	Val	Asp
	50				55					60					
Gln	Thr	Thr	Ala	Leu	Ala	Ala	Ile	Glu	Ala	Leu	Val	Glu	Leu	Gly	Leu
65				70				75						80	
Leu	Val	Pro	Ser	Ala	Ser	Ile	Ser	Ser	Gln	Lys	Ala	Gly	Ile	Gln	Leu
				85				90						95	
Trp	Val	Asp	Lys	Gly	Trp	Val	Asp	Ala	Leu	Ile	Leu	His	Phe	Ala	Ser
		100					105						110		
Arg	Asn	Leu	Asn	Tyr	Asn	Asp	Asp	Pro	Ile	Glu	Phe	Gly	Gly	Leu	Glu
		115				120						125			
Asp	Ile	Lys	Ser	Tyr	Pro	Glu	Pro	Met	Glu	Ser	Lys	Arg	Arg	Lys	Arg
	130					135					140				
Gly	Thr	Ala	Thr	Arg	Leu	Val	Lys	Pro	Ser	Arg	Glu	Leu	Ala	Ala	Ala
145				150					155					160	
Val	Ile	Leu	Asp	Gly	Leu	Met	Asn	Arg	Arg	Ser	Phe	Lys	Pro	Phe	Thr
			165				170						175		
Arg	Lys	Gln	Leu	Ser	Ile	Thr	Glu	Val	Ser	Glu	Ile	Leu	Trp	Phe	Gly
		180				185						190			
Asn	Leu	Tyr	Ala	Arg	Glu	Arg	Ala	Val	Ile	Ala	Glu	Asn	Arg	Asp	Phe
	195					200					205				
Glu	Ser	Pro	Arg	Asp	Ile	Ala	Phe	Asp	Ser	Ala	Phe	Ser	Ala	Leu	Ser

210		215		220
Thr Phe Val Val Thr Tyr Gly Gln Ile Asp Trp Gln Asp Gly Ser Leu				
225		230		235
Pro Pro Gly Val Tyr Arg Tyr Asn Val Val Asn His Glu Leu Glu Ala				
	245		250	255
Ile Arg Ala Gly Asp Phe Lys Leu Asp Met Ala Lys Leu Ala Ile Gly				
	260		265	270
Gln Ser Arg Ala Ser Ser Gly Leu Phe Thr Phe Val Ile Cys Gly Asp				
	275		280	285
Leu Lys Ser Tyr Thr Ser Arg Tyr Arg His Glu Arg Ser Tyr Arg Asn				
	290		295	300
Leu Leu Ile Asn Thr Ser Gln Leu Ala Gln Phe Tyr Leu Thr Leu Ala				
305		310		315
Thr Ile Asn Asp Phe Asn Thr Phe Leu Thr Pro Ala Ile His Asp Glu				
	325		330	335
Lys Met His Leu Phe Leu Glu Ala Glu Asp Asp Leu Pro Leu Tyr Leu				
	340		345	350
Val Thr Ala Gly				
355				

<210> 9  
 <211> 252  
 <212> PRT  
 <213> Rhizobium leguminosarum bv. trifolii

<400> 9

Met His Tyr Arg Thr Asp Lys Pro Lys Val Phe Val Thr Asp Ser Gly				
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Arg Phe Val Ala Asp Cys Gln Ile Ile Leu Leu Gly Arg Lys Ile Ile				
	20		25	30
Cys Thr Gly Thr Asp Leu Gln Tyr Glu Ile Ala Val Ala Lys Ala Lys				
	35		40	45
Ser Glu Leu Ala Glu Arg Ile Ala Phe Ala Ser Pro Asp Ala Phe Asn				
	50		55	60
Ala Arg Val Thr Arg Val Ala Arg Arg Leu Met Leu Glu Ala Thr Asn				
65		70		75
Ala Phe Asn Arg Glu Ser Val Thr Leu Pro Leu Ser Leu Phe Val Thr				
	85		90	95
Arg Pro His Leu Cys Trp Met Arg Gly Asn Asn Ser Thr Gly Phe Ala				
	100		105	110
Ala His Pro Arg Arg Lys Ala Ala Ile Glu His Ala Val Asn Glu Val				
	115		120	125
Leu Glu Arg Gly Trp Asn Ala Arg Phe Arg Arg Asp Gln Gln Ser Leu				
	130		135	140
Leu Lys Leu Ala Thr Ile Arg Arg Asp Gly Ser Thr Ala Trp Val His				
145		150		155
Glu Ser Arg Leu Arg Gln Val Ser Tyr Cys Leu Ala Asn Ala Arg Val				



				165					170					175			
Ala	Gly	His	Val	Gly	Trp	Gly	Ser	Ala	Val	Arg	Arg	Thr	Thr	Glu	Ala		
			180					185						190			
Ala	Val	Glu	Ala	Ala	Thr	Ser	Glu	Ala	His	Ala	Met	Ser	Ala	Ser	Gly		
		195					200					205					
Gln	Asp	Tyr	Gly	Arg	Gly	Gly	Thr	Gly	Val	Ser	Glu	Leu	Pro	Ser	Gln		
	210					215					220						
His	Asp	Gln	Ile	Ala	Phe	Val	Glu	Arg	Gln	Pro	Val	Arg	Ile	Asp	Asp		
225					230					235					240		
Val	Thr	His	Tyr	Val	Ile	Gln	Ala	Val	Ser	Tyr	Ser						
				245					250								